Revision 1, Addendum 2 - VI Mitigation Work Plan

South Dayton Dump and Landfill Site
Moraine, Ohio

Submitted to:
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1. Introduction

This addendum to the Vapor Intrusion (VI) Mitigation Work Plan (CRA, May 2013) for the South Dayton Dump and Landfill Site (Site), Moraine, Ohio is intended to update the existing VI Mitigation Work Plan to describe proposed sampling activities required to measure explosive limits in utility corridors during seasonal periods of elevated methane levels. Revision 1 of the Addendum provides an update to remove obligations of Respondents to monitor soil gas probes that contain elevated levels of contaminants that are not associated with the Site.

This addendum is intended to be used in conjunction with the VI Mitigation Work Plan and is not a stand-alone document.

2. Sampling Activities

2.1 Landfill Gas and Soil Vapor Sampling

The VI Mitigation Work Plan outlines the measurement and recording of methane levels using a portable combustible gas meter, specifically LandTec GEM 2000 or equivalent, which is capable of reporting the concentration of methane in units of percentage of the LEL of methane (i.e., 0 to 100 percent of LEL). The Work Plan did not specify an end date with regards to methane monitoring but the Respondents continued to monitor methane on a weekly basis between January 19, 2012, and April 2, 2014 in Building 15 (SIM Trainer) and between November 9, 2012 and April 2, 2014 in USEPA nested soil gas probe GP-2, in response to noted periods of elevated methane levels. During the VI mitigation conference call held on March 6, 2014, USEPA and the Respondents agreed to reduce the frequency of methane monitoring from weekly to monthly, conditional on the Respondents' submission of a plan detailing sampling activities to measure explosive limits in utility corridors during seasonal periods of elevated methane levels.

The USEPA (2005) document Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned Landfills states that warm landfill temperatures favor methane production, which may be affected by seasonal temperature fluctuations in cold climates where fill is shallow and sensitive to ambient temperatures, and that the highest methane concentrations occur in the warmer summer months. The Minnesota Pollution Control Agency (2011) document Guidelines for Monitoring for Landfill Gas at and Near Former Dumps states that methane generation can be non-existent at temperatures below 50°F. A review of methane results at GP-2 between November 2012 and ~~April 2014~~October 2016 indicates that methane concentrations generally increase~~d~~ between June ~~2013~~ and October ~~2013~~every year, with values exceeding 100 percent of LEL (i.e., greater than 5 percent methane by volume, in air) in the months of July, August, and September (Table 1). The increase in methane corresponds to an increase in ambient temperature throughout the summer months. On behalf of the Respondents, GHD submitted a letter to USEPA and Ohio EPA dated October 24, 2016, detailing evidence that the source of methane at GP-2 is not related to the South Dayton Dump and Landfill Site. Supporting evidence includes the consistent non-detectable levels of methane at soil gas probes along the Dryden Road Site boundary which demonstrate the lack of off-Site migration of methane; the proximity of GP-2 to the Dayton Power and Light (DP&L) Transportation Center and area former USTs; and stratigraphic conditions that do not encourage the lateral movement of subsurface soil gas along preferential pathways. The Respondents revised

this addendum to remove methane monitoring at locations which exhibit contamination that is not associated with the Site (e.g., GP-2).

Methane results for Building 15 (SIM Trainer) are presented in Table 2. Prior to the installation of the sub-slab depressurization system (SSDS) on January 9, 2014, methane concentrations were consistently greater than 10 percent of the LEL (0.5 percent methane) at sub-slab soil vapor Probe C (i.e. SS-15-C). The greatest methane concentrations, approximately 40-60 percent of the LEL (2 to 3 percent methane), were recorded during the warmer months of July, August, September, and October in 2012 and 2013. Respondents installed a permanent explosive gas monitor in Building 15 (SIM Trainer) on January 31, 2013 for continuous indoor air monitoring in addition to the weekly methane monitoring events. Since the SSDS system has been in operation, methane values have decreased and consistently ranged from 1 5 percent of the LEL (0.05 to 0.25 percent methane).

From 2012 to 2016, ~~The~~ the Respondents ~~propose to collect~~conducted methane monitoring from soil gas probe GP-2 on a four tiered sampling system based on information provided in the USEPA (2005) and Minnesota Pollution Control Agency (2011) documents, and historical methane monitoring results completed at GP-2. ~~Methane and other gases detected at GP-2 are not related to South Dayton Dump and Landfill Site. Accordingly, Respondents will cease routine methane monitoring at locations which exhibit contamination that is not associated with the Site (i.e., GP-2) following USEPA approval of this Revision~~ 1 to ~~Addendum 2.~~Based on the apparent lack of connection between the Site and GP-2, Respondents will cease routine methane monitoring at GP-2 following USEPA approval of this Revision 1 to Addendum 2.

~~Tier 1 sampling at GP-2 will be conducted monthly during periods where methane values are less than 100 percent of the LEL (5 percent methane by volume in air). Tier 2 sampling at GP-2 will be conducted weekly when methane values are greater than 100 percent of the LEL (5 percent methane). The detection of methane at GP-2 at values greater than 100 percent of the LEL (5 percent methane) will increase the monitoring plan frequency from Tier 1 to Tier 2 status (monthly to weekly sampling). When methane values at GP-2 decrease to less than 100 percent of the LEL (5 percent methane), methane monitoring frequency will decrease from Tier 2 weekly sampling to Tier 1 monthly sampling. If the methane values at GP-2 remain less than 100 percent of the LEL (5 percent methane) for three consecutive months, the methane monitoring frequency will decrease from Tier 1 monthly sampling to Tier 3 semi-annual sampling (i.e., in January and July). If the Tier 3 methane values at GP-2 remain less than 100 percent of the LEL (5 percent methane) for 2 calendar years (i.e., 4 sample rounds), methane monitoring frequency will decrease from Tier 3 semi-annual sampling to Tier 4 annual sampling. The four-tiered sampling plan for soil gas probe monitoring at GP-2 is outlined in Table 2.1.~~

~~Table 2.1 - Four-Tiered Sampling Plan for Soil Gas Probe Monitoring at GP-2~~

	~~Tier 1~~	~~Tier 2~~	~~Tier 3~~	~~Tier 4~~
~~Triggering Condition~~	~~Methane levels less than 100 percent of the LEL (5 percent methane)~~	~~Methane levels greater than 100 percent of the LEL (5 percent methane)~~	~~3 consecutive months of methane levels less than 100 percent of the LEL (5 percent methane)~~	~~2 years of methane levels less than 100 percent of the LEL (5 percent methane)~~
~~Action~~	~~Monthly sampling~~	~~Weekly~~	~~Semi-annual~~	~~Annual sampling~~

	~~Tier 1~~	~~Tier 2~~	~~Tier 3~~	~~Tier 4~~
		~~sampling~~	~~sampling~~	
~~Exit Condition~~	~~If methane levels are less than 100 percent of the LEL (5 percent methane) for 3 consecutive months, decrease frequency to semi-annual monitoring (Tier 3)~~	~~Methane levels less than 100 percent of the LEL (5 percent methane) Resume Tier 1 sampling.~~	~~If methane levels are less than 100 percent of the LEL (5 percent methane) for 2 years (i.e., 4 sample rounds), decrease frequency to annual monitoring (Tier 4)~~	~~Reevaluate the potential for landfill gas migration and VI during the Remedial Design/Remedial Action.~~ ~~End sampling following implementation of the Remedial Action~~

Methane monitoring will be conducted from sub-slab soil vapor probes (SSSVPs) at Building 15 (SIM Trainer) on a three-tiered sampling system based on information provided in the USEPA (2005) and Minnesota Pollution Control Agency (2011) documents, and historical methane results for Building 15 (SIM Trainer). Tier 1 sampling will be conducted monthly during periods where methane values in the SSSVPs are less than 10 percent of the LEL (0.5 percent methane by volume in air). Tier 2 sampling will be collected biweekly when methane values in the SSSVPs are between 10 and 100 percent of the LEL (0.5 to 5 percent methane) and Tier 3 sampling will be completed when methane values in the SSSVPs are greater than 100 percent of the LEL (5 percent methane). The detection of methane in any of the SSSVPs at values greater than 10 percent of the LEL (0.5 percent methane) will increase the monitoring plan frequency from Tier 1 to Tier 2 status (monthly to biweekly sampling). When methane values in all of the SSSVPs decrease to less than 10 percent of the LEL (0.5 percent methane), methane monitoring frequency will decrease from Tier 2 biweekly sampling to Tier 1 monthly sampling. Similarly, the detection of methane in any of the SSSVPs at values greater than 100 percent of the LEL (5 percent methane) will increase the monitoring plan frequency to Tier 3 status (weekly sampling). Weekly sampling will continue until methane levels in all SSSVPs are reduced to less than 100 percent of the LEL (5 percent methane). If the Building 15 SSSVP methane levels remain less than 10 percent of the LEL (0.5 percent methane) for three consecutive months, the monitoring frequency will decrease from Tier 1 monthly sampling to Tier 4 semi-annual sampling (i.e., in January and July). If the Building 15 SSSVP Tier 4 semi-annual methane levels remain less than 10 percent of the LEL (0.5 percent methane) for 2 calendar years (i.e., sample rounds), methane monitoring frequency will decrease from Tier 4 semi-annual sampling to Tier 5 annual sampling. The five tiered sampling plan for Building 15 (SIM Trainer) sub-slab soil vapor probes is outlined in Table 2.1.

Table 2.1 - Five-Tiered Sampling Plan for Sub-slab Soil Vapor Monitoring at Building 15 (SIM Trainer)

	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Triggering Condition	Methane levels less than 10 percent of the LEL (0.5 percent methane) in all SSSVPs	Methane levels between 10 and 100 percent of the LEL (0.5 to 5 percent methane) in any SSSVP.	Methane levels greater than 100 percent of the LEL (5 percent methane) in any SSSVP	3 consecutive months of methane levels less than 10 percent of the LEL (0.5 percent methane)	2 years of methane levels less than 10 percent of the LEL (0.5 percent methane)
Action	Monthly sampling	Biweekly sampling	Weekly sampling	Semi-annual sampling	Annual sampling
Exit Condition	If methane levels are less than 10 percent of the LEL (0.5 percent methane) in all SSSVPs for 3 consecutive months, decrease frequency to semi-annual monitoring (Tier 4)	Methane levels less than 10 percent of the LEL in all SSSVPs (0.5 percent methane). Resume Tier 1 sampling.	Methane levels less than 100 percent of the LEL in all SSSVPs (5 percent methane) Resume Tier 2 sampling.	If methane levels are less than 10 percent of the LEL (0.5 percent methane) for 2 years (i.e., 4 sample rounds), decrease frequency to annual monitoring (Tier 5)	Reevaluate the potential for landfill gas migration and VI during the Remedial Design/Remedial Action. End sampling following implementation of the Remedial Action

The Respondents will reevaluate the potential for landfill gas migration and vapor intrusion during the Remedial Design/Remedial Action, and additional actions will be taken if required.

2.1.1 Soil Vapor Sampling in Utility Corridors

Respondents obtained and reviewed buried utility information provided by Ohio Utilities Protection Services (OUPS) in order to examine the possibility of preferential gas migration pathways to GP-2. The location of buried utilities were summarized in the GHD memorandum to USEPA and Ohio EPA dated September 21, 2016.

In September 2016, GHD completed a visual inspection and methane monitoring at three pairs of storm water inlets, four manholes, and one sanitary manhole located along Dryden Road in the area of GP-2. From the visual inspection, GHD determined that storm water flows from east to west across Dryden Road, and then north.

On September 28, 2016 and October 7, 2016, GHD completed methane monitoring at the storm water inlets and manholes in the vicinity of GP-2; methane was not detected at these locations. ~~Elevated methane levels (greater than 5 percent by volume, in air) were detected in July, August, and September of 2013 at soil gas probe GP-2, but not at the remaining USEPA nested soil gas probes (GP-1, GP-3, GP-4, GP-5, GP-6, and GP-7). Figure 1 contains a Site plan depicting USEPA~~

~~soil gas probe and on Site Landfill Gas (LFG) probe locations. The Respondents propose to use sampling results from GP-2 as a screening tool to indicate when additional methane sampling will be completed at nearby soil gas probes. Any detection of methane at GP-2 at concentrations greater than 100 percent of the LEL (5 percent methane), will require an immediate sampling round consisting of adjacent USEPA nested soil gas probes (GP-2 (remaining intervals) and GP-7) and on Site landfill gas probes (GP12-09, GP23-13, GP24A-13, and GP24B-13), henceforth referred to as the GP-2 area soil gas probes. In accordance with the tiered sampling plan detailed in Table 2.1, the Respondents will complete weekly methane monitoring of any GP-2 area soil gas probe where methane values are greater than 100 percent LEL (5 percent methane). The detection of methane at a level greater than 100 percent of the LEL (5 percent methane) at any on Site GP-2 area soil gas probe (i.e., GP-7, GP12-09, GP23-13, GP24A-13, and GP24B-13) for two consecutive rounds indicates methane detections may be Site related, and will result in soil gas screening and/or sampling of utility corridors adjacent to the gas probe(s) in exceedance (see below for sampling techniques). The detection of methane at GP-2 area probes at a level less than 100 percent of the LEL (5 percent methane) will require monthly sampling in accordance with the tiered sampling plan detailed in Table 2.1. Further action will not be required at any GP-2 area soil gas probe when methane values are 0 percent of the LEL (0 percent methane) with the exception of soil gas probe GP-2 which will continue to be sampled for methane in accordance with the criteria outlined in Table 2.1.~~

After the installation of the SSDS on January 9, 2014, at Building 15 (SIM Trainer), methane levels in SSSVPs have been consistently measured between 0 to 10 percent of the LEL (0 to 0.5 percent methane). The Respondents propose that results of methane monitoring from Building 15 (SIM Trainer) SSSVPs SS-15-A, SS-15-B, and SS-15-C be used as a screening tool to determine when additional methane monitoring will be completed at nearby soil gas probes. Any detection of methane at any Building 15 (SIM Trainer) SSSVPs at concentrations greater than 10 percent of the LEL (0.5 percent methane) will require an immediate sampling round consisting of adjacent USEPA nested soil gas probe GP-3 and on Site landfill gas probes GP14-09 and GP15-09, henceforth referred to as Building 15 area probes. All Building 15 area probes where methane values are greater than 10 percent of the LEL (0.5 percent methane) will then require biweekly sampling until methane values are less than 10 percent of the LEL (0.5 percent methane). Weekly sampling will be completed at any Building 15 area probe where methane values are greater than 100 percent of the LEL (5 percent methane) and detection of methane at levels greater than 100 percent of the LEL (5 percent methane) for two consecutive rounds will result in soil gas screening and/or sampling of utility corridors adjacent to the probe(s) in exceedance (see below for sampling techniques). Further action will not be required at any Building 15 area probes where methane values are less than 10 percent of the LEL (0.5 percent methane). Building 15 (SIM Trainer) SSSVPs will continue to be sampled for methane in accordance with the criteria outlined in Table 2.2.

Once the conditions for additional methane monitoring in the adjacent utility corridors have been met (described above), the Respondents propose either of the following methods be used for utility corridor sampling along the Site boundary. The first method requires soil vapor monitoring within sewers and the associated manholes, as discussed in the Wisconsin Department of Natural Resources Guidance for Documenting the Investigation of Utility Corridors (2013). Soil vapor sampling within manholes and sewers along the Site boundary will be conducted by lowering a portable combustible gas analyzer into the manhole/sewer. In the event where ~~CRA~~ GHD field staff is unable to access the manhole/sewer, they will fill a Tedlar bag using a lung sampler with a long probe, which will then be field screened for methane. The second method involves installation of soil gas probes within or near identified utility corridors. This option would be used when it was not

possible to access the utility via a manhole or other means of access. ~~CRA~~GHD will install soil gas probes in the bedding material surrounding the underground utility(ies) located along the Site boundary, via hand digging. Weekly monitoring will be conducted at the newly installed soil gas probe locations to determine when conditions have stabilized and equilibrium has been re-established prior to completion of methane monitoring. Soil gas sampling from the newly installed soil gas probes will be conducted as outlined in the GHD Field Sampling Plan (~~CRA~~GHD, ~~2013~~2016).

The detection of methane at levels greater than 100 percent of the LEL (5 percent methane) from sampled utility corridors along the Site boundary will require the Respondents to pursue further remedial action in order to lower Site related methane levels to below the LEL. In the event that Respondents measure methane levels greater than 100 percent of the LEL at soil gas probes along the Site boundary, Respondents will collect methane measurements from soil gas probes located along the east side of Dryden Road (i.e., GP-2 and/or GP-5) as a screening and evaluation tool to determine follow-up actions.